



## Appendix C. The Risk Quotient Method and Levels of Concern

The Risk Quotient Method is the means used by the Environmental Fate and Effects Division (EFED) to integrate the results of exposure and ecotoxicity data. For this method, Risk Quotients (RQ) are calculated by dividing exposure estimates by the acute and chronic ecotoxicity values (*i.e.*,  $RQ = EXPOSURE/TOXICITY$ ). These RQs are then compared to the Office of Pesticide Programs' (OPP) levels of concern (LOC). These LOCs are criteria used by OPP to indicate potential risk to non-target organisms and the need to consider regulatory action. EFED has defined LOCs for acute risk, potential restricted use classification, and for endangered species.

The criteria indicate that a pesticide used as directed has the potential to cause adverse effects on non-target organisms. LOCs currently address the following risk presumption categories:

- (1) acute - there is a potential for acute risk; regulatory action may be warranted in addition to restricted use classification;
- (2) acute restricted use - the potential for acute risk is high, but this may be mitigated through restricted use classification;
- (3) acute endangered species - the potential for acute risk to endangered species is high, regulatory action may be warranted; and
- (4) chronic risk - the potential for chronic risk is high, regulatory action may be warranted.

Currently, EFED does not perform assessments for chronic risk to plants, acute or chronic risks to non-target insects, or chronic risk from granular/bait formulations to mammalian or avian species.

The ecotoxicity test values (*i.e.*, measurement endpoints) used in the acute and chronic RQs are derived from required studies. Examples of ecotoxicity values derived from short-term laboratory studies that assess acute effects are: (1)  $LC_{50}$  (fish and birds), (2)  $LD_{50}$  (birds and mammals), (3)  $EC_{50}$  (aquatic plants and aquatic invertebrates), and (4)  $EC_{25}$  (terrestrial plants). Examples of toxicity test effect levels derived from the results of long-term laboratory studies that assess chronic effects are: (1) the Lowest Observed Adverse Effect Concentration (LOAEC) (birds, fish, and aquatic invertebrates), and (2) the No Observed Adverse Effect Concentration (NOAEC) (birds, fish and aquatic invertebrates). The NOAEC is generally used as the ecotoxicity test value in assessing chronic effects. Risk presumptions, along with the corresponding RQs and LOCs are summarized in Table C-1.

| Table C-1. Agency risk quotient (RQ) metrics and levels of concern (LOC) per risk class. |   |  |      |
|--|---|--|------|
| Risk Class   | Risk Description  | RQ   | LOC  |
| Aquatic Animals (fish and invertebrates)   |   |  |      |
| Acute  | Potential for effects to non-listed animals from acute exposures  | Peak EEC/LC <sub>50</sub> <sup>1</sup>       | 0.5  |
| Acute Restricted Use   | Potential for effects to animals from acute exposures<br>Risks may be mitigated through restricted use classification | Peak EEC/LC <sub>50</sub> <sup>1</sup>       | 0.1  |
| Acute Listed Species   | Listed species may be potentially affected by acute exposures   | Peak EEC/LC <sub>50</sub> <sup>1</sup>       | 0.05 |
| Chronic  | Potential for effects to non-listed and listed animals from chronic exposures   | 60-day EEC/NOEC (fish)                       | 1    |
|  |   | 21-day EEC/NOEC (invertebrates)              |      |
| Terrestrial Animals (mammals and birds)  |   |  |      |
| Acute  | Potential for effects to non-listed animals from acute exposures  | EEC <sup>2</sup> /LC <sub>50</sub> (Dietary) | 0.5  |
|  |   | EEC/LD <sub>50</sub> (Dose)                  |      |
| Acute Restricted Use   | Potential for effects to animals from acute exposures<br>Risks may be mitigated through restricted use classification | EEC <sup>2</sup> /LC <sub>50</sub> (Dietary) | 0.2  |
|  |   | EEC/LD <sub>50</sub> (Dose)                  |      |
| Acute Listed Species   | Listed species may be potentially affected by acute exposures   | EEC <sup>2</sup> /LC <sub>50</sub> (Dietary) | 0.1  |
|  |   | EEC/LD <sub>50</sub> (Dose)                  |      |
| Chronic  | Potential for effects to non-listed and listed animals from chronic exposures   | EEC <sup>2</sup> /NOAEC                      | 1    |
| Plants   |   |  |      |
| Non-Listed   | Potential for effects to non-target, non-listed plants from exposures   | EEC/ EC <sub>25</sub>                        | 1    |
| Listed Plant   | Potential for effects to non-target, listed plants from exposures   | EEC/ NOEC                                    | 1    |
|  |   | EEC/ EC <sub>05</sub>                        |      |
| <sup>1</sup> LC <sub>50</sub> or EC <sub>50</sub> .                                      |   |  |      |
| <sup>2</sup> Based on upper bound Kenaga values.   |   |  |      |